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# Understanding climate resilience in Ghanaian cocoa communities – Advancing a biocultural perspective

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ABSTRACT

This paper aims to contribute to the ongoing conceptual development and practical pursuit of resilience, the ability to absorb and respond to shocks, in an agricultural and climate change context. It builds on work that aims to dissolve the nature-society dualism and naturalisation of power relations inherent in systems thinking by developing and extending a framework originally conceived to integrate research on biological and cultural diversity. The resultant 'biocultural' framework examines livelihood practices, institutions, knowledge and beliefs and is applied to a case study of cocoa communities in Ghana's Central Region. Drawing on data collected over three years spanning an El Niño Southern Oscillation (ENSO) related drought event, the analysis demonstrates the utility of an expanded conception of resilience that links livelihood practices, which define the impact and response to droughts, with the constituent knowledge, institutions and beliefs that shape those practices. The study focuses on two key factors that underpin cocoa farmers' resilience to climate shocks: access to wetlands and access to credit. We argue that particular characteristics of livelihood practices, knowledge, belief and institutions, and their interactions, can be both resilience enhancing and undermining, when viewed at different spatial, temporal and social scales. Although such contradictions present challenges to policy-makers engaging with climate resilience, the analysis provides a clearer diagnoses of key challenges to the resilience of agricultural systems and insights into where policy interventions might be most effective.

## 1. Introduction

Climate change poses a significant threat to tropical agriculture and the millions of livelihoods that depend on it. In sub-Saharan Africa, although there will be variations across countries, trends towards greater temperature and precipitation extremes are likely to intensify (IPCC, 2014) exacerbating existing development challenges and inequality (Adger et al., 2006; Mearns and Norton, 2010; Okereke, 2010). Against this background interest in the pursuit of resilience has been growing (Barrett and Constas, 2014; Douxchamps et al., 2017; Howden et al., 2007; Pelling, 2010). Despite being the subject of several areas of debate, resilience is generally understood to refer to the ability of social, ecological, or social-ecological system to absorb, recover, respond and adapt to shocks (Folke et al., 2002).

Despite several decades of progress in these fields, there is still a significant research need in terms of developing insights into the factors that contribute to and undermine resilience that move beyond the biophysical, knowledge and financial constraints on agricultural production and address underlying political, social and psychological issues (Shackleton et al., 2015). This paper aims to develop deeper understandings of resilience to climate change in African agricultural communities by examining the case of Ghana's cocoa sector. To achieve this aim, the paper builds on the 'biocultural' framework developed by Pretty et al. (2009) and develops an approach to understanding resilience which incorporates livelihood practices, knowledge, beliefs and institutions. This approach is outlined in section 2, but the motivation for developing it is rooted in an intentional effort to build on existing work and capitalise on the ability of the concept to open up meeting points between social and natural sciences (Strunz, 2012), while simultaneously addressing long-discussed concerns regarding the weakness of some approaches to resilience with reference to questions of politics and culture (Arora-Jonsson, 2016; Cote and Nightingale, 2012; Kull and Rangan, 2016; Peterson, 2000).

The case of Ghana's cocoa sector is illustrative because there is

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growing concern regarding the impact of climate change on the crop and the ~1 million livelihoods it supports (COCOBOD, 2014; Commission, 2014; Gockowski and Sonwa, 2011; Läderach et al., 2013; Schroth et al., 2016). Although the impacts of climate change on cocoa in West Africa are not as drastic as initially feared, with strong spatial variations regionally, there is general agreement that the overall area of suitable land will decline in the coming decades (Läderach et al., 2013; Schroth et al., 2016). Whilst this may lead to spatial shifts of cocoa in due course, on shorter-time scales, there is a need to understand the resilience of cocoa farmers and their communities, whose involvement with cultivating cocoa is socially differentiated along gender, age and ethnicity lines (Anyidoho et al., 2012; Carr, 2008; Friedman et al., 2018). The 2015/2016 El Niño-South Oscillation (ENSO) event provides an excellent case with which to study the existing character of resilience in Ghana's cocoa communities.[1] This paper draws on data collected before, during and after the 2015–2016 drought to assess contemporary dynamics of resilience.

The paper is organised as follows. The next section describes the 'biocultural' framework this paper employs. In Section 3 we describe the study site and the methodology before Section 4 presents the main results. These are presented in three parts. The first provides an overview of the impact of the ENSO event to contextualise the subsequent sections which examine in detail the two primary coping and adaptive strategies employed in the community - the conversion of wetlands and the borrowing of money. The penultimate section critically reflects on these findings and develops the argument that the factors which underpin resilience in Ghana's cocoa community are intimately interwoven with the barriers to increasing resilience. The implications of this are examined in the conclusion along with specific recommendations for Ghana's cocoa sector and reflections on the climate resilience agenda in general.

## 2. Resilience and biocultural thinking – an analytical framework

The dualism between material nature and immaterial culture, which has both deep roots (e.g. in the Philosophy of Descartes) and modern expressions (e.g. in the eco-modernist manifesto, see Asafu-Adjaye et al., 2015), has been diagnosed as a symptom of humans' perceived need to manage and control nature (Berkes, 2012). However, it is increasingly recognised that nature and culture are inseparably interwoven and the implications of this ontological shift continue to be explored within several theoretical and academic disciplines and has underpinned calls for interdisciplinary research (Barry and Born, 2013; Descola, 2013; Pretty, 2011; Whatmore, 2002). Resilience has emerged as among the primary 'interdisciplines' that has developed an agenda that reflects the connections between nature and culture, manifest in the dominance of the term social-ecological systems. Resilience is widely referred to as 'the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change' (Adger, 2000:347), and is closely associated with a range of related and overlapping concepts, including absorbing shocks, coping, adaptation, adaptive capacity, and vulnerability (Adger, 2000, 2006; Berkes and Ross, 2013; Folke, 2006; Folke et al., 2002, 2005; Gallopín, 2006; Holling, 1973; Walker et al., 2004). Despite referring to a range of theoretical and conceptual approaches to social-ecological problems, in general the field of resilience research has been characterised by a normative, coherently systematic and reformist approach (Kull and Rangan, 2016). Climate resilience can be defined as the ability of individuals and communities to cope with, and adapt to, the social, political, economic and ecological challenges precipitated by a changing climate and climatic events.

Climatic resilience can vary significantly within and between communities because even small communities are typically hugely heterogenous and sites of political, social, economic and cultural contestation. The community of scholars engaging with the concept of resilience shares these characteristics. Notably, the 'mainstream' resilience community has been critiqued for the shift of resilience from an analytical framework to a normative agenda used to design and implement policy initiatives to manage social ecological systems (Folke et al., 2005; Olsson et al., 2006). In particular, concern has been raised about the normative commitments in resilience thinking, particularly when coupled with the tendency for systems thinking to overlook critical cultural and political contestations (Brown and Westaway, 2011; Cote and Nightingale, 2012; Fisher et al., 2013; Hornborg, 2009; Miller et al., 2010; Thorén and Olsson, 2017; Turner, 2014). As Tschakert and Dietrich (2010:12) note in the context of climate resilience, the emergence of 'climate-proofing' thinking that suggests that development plans can be shielded from climate change simply by the identification and implementation of appropriate (typically technological) adaptive measures actually 'obscures the very processes that shape adaptive and resilient livelihoods'.

These critiques point towards the need for ongoing theoretical developments and practical applications that can provide insights into the complexities of pursing resilience. This paper proposes that building on four 'bridges' widely identified within in the resilience literature, and brought together by Pretty et al. (2009) to integrate biological and cultural diversity, can be fruitfully developed in the context of examining climate resilience. The bridges of this 'biocultural' analytical framework are livelihood practices, knowledge, institutions and beliefs, and are briefly examined below.

### 2.1. Livelihood practices

Agriculture in general, and cocoa farming in particular, is a critical livelihood practice in Ghana and elsewhere in West Africa. Livelihood practices, broadly conceived here as the actions people take to try and meet their needs and fulfil their desires, are central to understanding the constituents of resilience because they both profoundly shape, and are shaped by, ecological processes. The emergence of the ecosystem services framework and related research (Assessment, 2005) testifies to the contributions ecosystems make to human wellbeing, but as Comberti et al. (2015) argue, the relationship between people and ecosystems is reciprocal. Increasingly, the idea of nature as wilderness, devoid of human intervention, is being replaced by an understanding that all landscapes are shaped, either directly or indirectly, by human activities (Nelson and Callicott, 2008). Furthermore, there is a general tendency, especially within the ecosystem services literature, to focus on the positive components of nature's contributions to humans, but there are a range of dis-services and antagonisms; natural process can frustrate the endeavours of human actions just as human activity may undermine the functioning of ecological processes that underpin the provision of ecosystem services (Dunn, 2010; Lyytimäki and Sipilä, 2009; von Döhren and Haase, 2015; Zhang et al., 2007). These interactions mean examining material livelihood practices is an essential element of resilience that may be marginalised in analyses which focus exclusively on the factors such as knowledge, institutions and beliefs that underpin those practices (Berkes, 2012; Gorddard et al., 2016; Tanner et al., 2014) Nonetheless, knowledge, institutions and beliefs do form a sound basis for developing deeper understanding of the social-ecological relations that shape patterns of resilience, and are examined below.

[1] Rainfall patterns in West Africa are largely shaped by sea surface temperatures in the Gulf of Guinea which in turn are determined by multiple interacting phenomena, including the Inter-Tropical Convergence Zone (ITCZ), Atlantic Mulit-Decadal Oscilliation (AMO), Indian Ocean Dipole (IOD) and El Nino Southern Oscillation (ENSO). Disentangling the relative influence of these teleconnections is challenging and therefore it is difficult to precisely attribute particular weather observations in West Africa to ENSO. In the absence of any meteorological analysis suggesting otherwise, it is assumed that ENSO contributed to the extended dry season in Ghana.

### 2.2. Knowledge

Knowledge is widely acknowledged as a critical component of resilience and related concepts. In Ghana, for example, there is growing interest in advancing the knowledge of ecology and practice of cocoa farming, in particular how the crop and its farmers will respond to a changing climate (e.g. (Gockowski and Sonwa, 2011; Läderach et al., 2013; Obiri et al., 2007; Schroth et al., 2016)). Much of the literature on knowledge and resilience has called for an integration of 'Western' natural and social science, with other knowledges, frequently termed local or traditional ecological knowledge. Much enthusiasm has been generated about transdisciplinarity in resilience, but there remains a risk that the politics of knowledge is subsumed by the culture of resilience thinking, in particular the social-ecological systems thinking that 'naturalises' social and power relations (but see (Boonstra, 2016)). Where modern science and local knowledge align (e.g. (Pretty, 2011)), the prospects for integration of knowledges and transdisciplinary approaches to resilience may be strong, but when they are in tension questions arise about the how the exercise of power operates to marginalise and entrench inequalities. As Arora-Jonsson (2016:102) notes, examining 'How apparently neutral and innocuous models and assumptions might subsume unequal relations, must be recognised as a necessary and inevitable part of environmental research.' In undertaking this examination, knowledge in this paper is conceptualised as *situated*, that is embedded in relationships of power (Haraway, 1991; Arora-Jonsson, 2016). A key manifestation of this embeddedness is through institutions.

### 2.3. Institutions

Institutions are widely defined as the formal and informal rules and norms that enable and constrain the actions of individuals and groups (North, 1990). They are a key component in understanding the governance arrangements of social and ecological systems (e.g. Agrawal, 2001; Leach et al., 1997; Ostrom, 1990). Institutions concerning who can use land or other resources, and how, are particularly relevant for exploring resilience to climate shocks in agricultural contexts. In Ghana, much of the research on institutions has focussed on land tenure and associated issues from a variety of perspectives (e.g. Amanor and Ubink, 2008; Cotula and Chauveau, 2007; Damnyag et al., 2012; Owubah et al., 2001). Cleaver (2014) distinguishes between 'mainstream' institutionalism and the relatively nascent 'critical' institutionalism. The key distinguishing features of critical institutionalism is that instead of emphasising the extent to which individuals and organisations can exert rational control of institutions with predictable outcomes, it focuses analyses on the complexity of interactions between everyday life practices and institutions at various scales, the historical formation of institutions and an explicit recognition of how power relationships and people's complex social identities shape decision-making arrangements and outcomes (Dressler et al., 2016; Hall et al., 2014; Koehler et al., 2018; Nunan et al., 2015). Therefore, examining people's beliefs, worldviews and value systems, as a central component of social identity, becomes a key task.

### 2.4. Beliefs and worldviews

Beliefs and worldviews, along with associated values, shape individuals' and groups' perceptions of their relationship with the world, their actions and their decision-making criteria, including with respect to resilience (Berkes, 2012; Berkes and Ross, 2013; Dietz et al., 2005; Kenter et al., 2015; O'Brien and Wolf, 2010). Within resilience research close attention has been paid to the role of beliefs in conserving areas of ecological importance, notably, through sacred spaces (Berkes, 2012) where spiritual and ecological values harmonise to motivate conservation. Although many mono-theistic religions (which dove-tail with animist religions in many parts of Africa, including Ghana (Ter Haar, 2009)) are framed as underlying capitalist dominion over nature (e.g. (White, 1967)), this interpretation is partial and there are environmental movements within all the world's major religions (Dudley et al., 2009; Jenkins and Chapple, 2011). The concepts of belief and values tend to go in and out of fashion in environmental research largely because of the complexity and ambiguity of the interactions between beliefs and behaviour (Hitlin and Piliavin, 2004). This has been exacerbated by a trend towards rational actor models theories which poorly incorporate the role of beliefs where a fuller understanding of the cultural, physical and social drivers of behaviour are required (Peattie, 2010). Nonetheless, beliefs are an important component in understanding the dynamics of the ways in which humans determine normative framings of resilience.

In essence, the role of beliefs in shaping human decisions and actions in relation to ecology or environment is mediated by material livelihood practices and experience, knowledge, and institutions, such that these components are inseparable from the biophysical; understanding the 'whole' (nature-culture unified, or social-ecological systems) or joined up social ecological system is required to understand each constituent component. However, examining each component separately is analytically useful for developing insights into what are the defining social characteristics of resilience in coupled systems. Furthermore, as Arora-Jonsson (2016) notes, while moving beyond the Cartesian nature-culture dualism is important, understanding the pluralities and differences within wholes is essential in order to a move to a more just future because it facilitates an understanding and recognition of the inevitably partial perspectives proffered in the pursuit of integrated views. In pursuit of such a future, this four-part framework entailing livelihood practices, knowledge, institutions and beliefs, is employed to examine the resilience of cocoa farmers to climate shocks by drawing on data collected over a 3–4 year period covering the 2015–2016 El Niño. The next section describes the methods used in this paper. In section 4 we then use the lens of biocultural resilience to examine two components that have proven critical to resilience in our Ghanaian case study, access to wetlands and the dynamics of credit.

## 3. Methods

Understanding climate resilience requires an approach that recognises the material realities of climatic shocks, their impacts and the normative imperative to develop appropriate responses, but also recognises how the situated nature of research and unequal power relations can have profound impacts on questions of who wins and who loses from the pursuit of resilience strategies (Forsyth, 2001, 2008; Kull et al., 2015; Marino and Ribot, 2012). Consequently, in the design of the research, the collection of data, the analysis and the reporting we aim to minimise the risk of marginalising different perspectives, but without adopting the post-modern perspective that, *in extremis*, contends all perspectives are equally valid/invalid, which as Gandy (1996) argues undermines the possibility for normative scientific discourse.

The analysis draws on qualitative data collected in six communities in the Assin South district of Ghana's Central Region (see Fig. 1). The landscape is dominated by Kakum National Park which is surrounded by mainly small-holder farmers cultivating cocoa, oil palm and food crops on relatively small ~4ha farms. At its inception, in 2013, the project involved understanding the relationship between the ecology of the landscape and the livelihoods of its communities (see www.ecolimits.org). The project was then extended to examine the impacts of the El Niño in the study area. This development permitted data to be collected over a series of trips between December 2013 and April 2017. Initial data collection developing a general understanding of the system and the factors which shape patterns of social and ecological well-being at multiple scales (including individual, household, community, regional and national scales) and then subsequent research examining in detail the impact and response to the drought. The project also had an ecological component that included meteorological monitoring, the

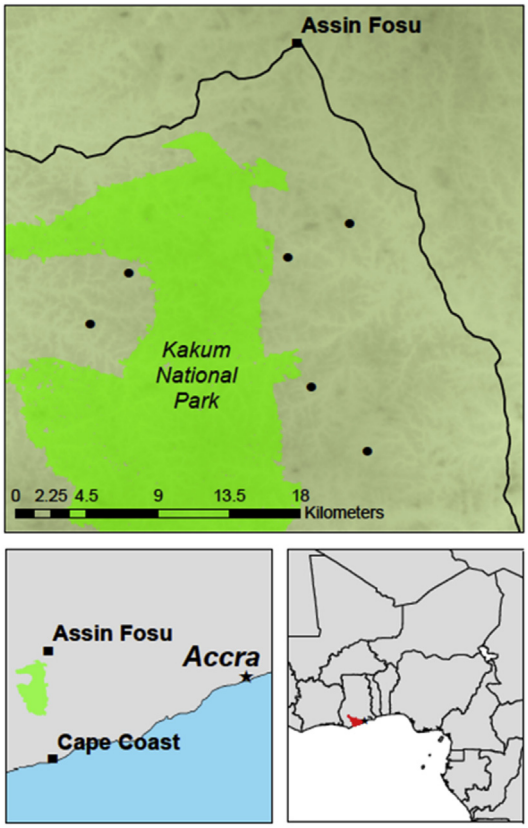


**Fig. 1.** Map showing study sites. Circles represent approximate location of studied villages. Squares represent major settlements and the star shows the capital city, Accra.

data from which are used to contextualise the event in Section 4.

Focus groups were held with members of the communities in December 2014, July 2016 and March 2017. Each year a male and female focus group discussions from each of the 6 communities was conducted, so in total 18 focus groups were conducted over the course of the research period.[2] Participants for these groups were purposively sampled to include local leaders from both the traditional leadership structure (local chiefs and elders), designated youth leaders and a male and female representative elected to liaise between the communities and the research team and leading cocoa farmers from the community. These groups' activities included charting the agricultural calendar, mapping key natural and infrastructural resources, discussing the ecology of cocoa and reflect on the impact of and response to the drought.

In addition to the focus groups, semi-structured interviews were conducted with key informants, including farmers, traditional authorities, district assembly members, cocoa purchasing clerks in villages. These interviews were used to validate findings from the focus groups, including to balance the potential bias towards local elites and wealthier members of communities, and their perspective that the focus groups risked portraying. In particular, and in recognition of the importance disaggregating communities, interviews were conducted with a range of community members including younger farmers, caretaker farmers, women and migrants. Further interviews with local officials, national level policy-makers, including from Ghana Cocoa Board and Ghana Forestry Commission, local and national level private sector representatives (licenced cocoa bean buying companies) on these and other 5 field trips (December 2013, April 2014, October 2015, May–June 2015, October 2016). The data collected revolved around the role of cocoa plays in people's livelihoods, the impact of the extended dry season in 2015–2016 and the response. Running throughout the data collection was a focus on exploring the role of the key concepts in the framework outlined above: livelihood practices, knowledge, institutions and beliefs. These four components were the foundations of a coding framework that was used to interrogate the data using conventional qualitative techniques such as memoing and inductive coding to reduce the complexity of the data and develop explanations (Miles and Huberman, 1994).

The following section outlines the main findings of the study. First an overview of the El Niño associated drought event is provided which contextualises a discussion of how people's main livelihood practices were influenced by the drought. This line of research revealed the key aspects that shaped the extent to which people were adversely affected by the drought, and their ability to absorb, recover, respond and adapt to conditions were access to wetland areas for farming and credit. The next two sections examine these issues (access to wetland areas and credit) in turn. To bound the analysis, the role of knowledge, institutions and beliefs are focussed on those critical and context-specific components of resilience. In order to reflect the interwoven nature of livelihood practices, knowledge, institutions and beliefs, and maintain a consistent narrative, they are discussed synthetically, rather than separately.

## 4. Results

### 4.1. Overview of the 2015 El Niño in a Ghanaian cocoa community

Participants in this study experienced the 2015 El Niño as an extended dry season, followed by a wetter wet season. The extended dry season, or drought,[3] lasted from November 2015 to April 2016 and was both hotter, drier and longer than is considered typical. Respondents noted that when the rains did arrive they were more intense than is usual. The observations, of a hotter, drier period followed by an intensive period of rain are reflected in the meteorological observations from the site (see Fig. 2). Although drought is often conceptualised as a lack of rainfall, the timing and intensity of the rain has significant impacts on agricultural production. This means meteorological data aggregated over seasons or years can hide the impact of important, but sometimes subtle, changes in rainfall patterns.

The distribution of rainfall is among the factors that drive the intensity of periods of seasonal hunger which occur regularly in rural areas of West Africa (Richards, 1986). The primary impact of the intensified dry season was on food crops, with staples such as maize, cassava, yams and vegetables being particularly badly affected, with farmers reporting widespread failure and poor quality production. The main cash crop in the area, cocoa, was also badly affected, according to farmers. However, focus group respondents noted how local ecological conditions such as soil conditions and shade levels meant the impacts were heterogeneous both between farmers and on individual farms. Observations that sandy (dry) soils, the presence of rocks in the soil, which absorbed heat, and low levels of shade cover were associated with poorer cocoa production highlight the fine spatial scale of some environmental features dictating the impact of the drought on cocoa farms. The other significant cash crop in the area, oil palm, was not reported as being affected by the drought.[4]

The direct agricultural impacts of the drought translated into

[2] Specifically, groups in 2014 had a total of 72 participants, 12 from each community over a 6 day period. In 2016 there was a total of 24 participants, 4 from each community over a 2 day period and in 2017 we had a total of 36 participants, 6 from each community over a 3 day period.

[3] These terms are used synonymously in this paper, as both are derived from the same word in *Twi*, the local language.

[4] Although the impact of drought on oil palm may not be reflected in yields until the years following the drought (Mohd et al., 2010).

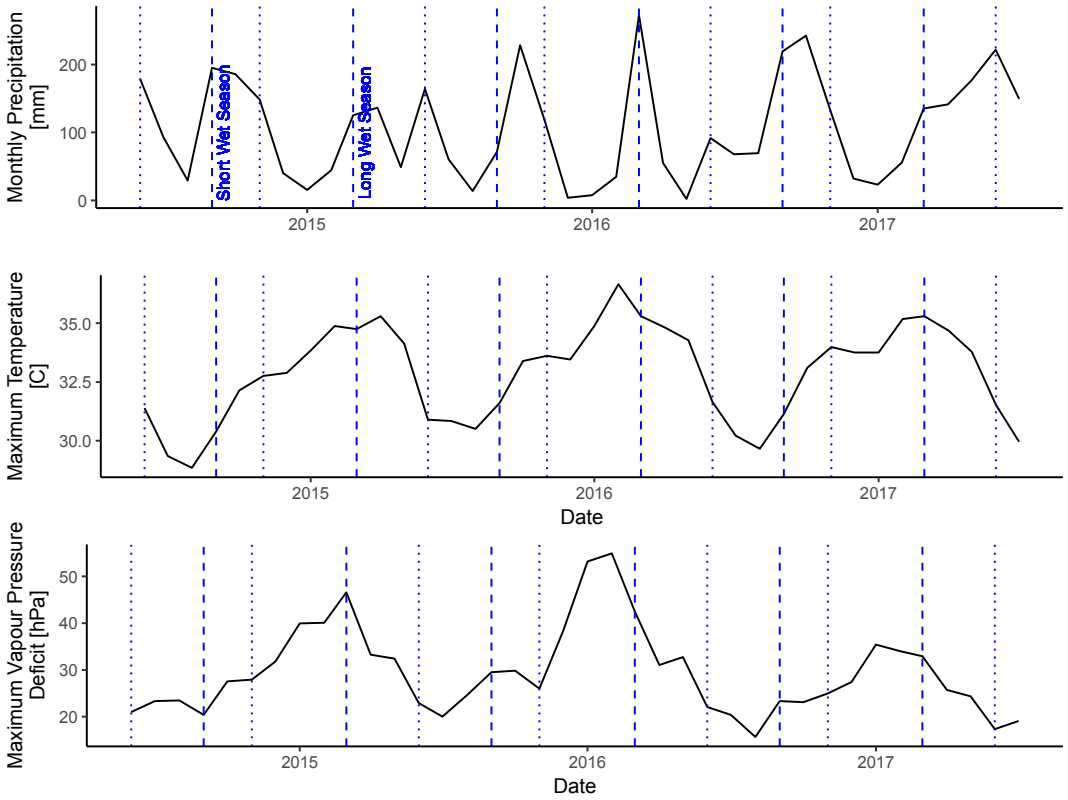


**Fig. 2.** Monthly precipitation (mm), temperature (C) and maximum vapour pressure deficit (VPD - a measure of the 'drying power' of the atmosphere is) 2015–2017, from a meteorological station data located in the field site. The pink shaded area signifies peak El Niño conditions. While aggregated data do not show significant seasonal/annual variation in rainfall, these data support observations that the El Niño period was characterised by hotter and more drying conditions with delayed and more intense periods of rainfall. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

relative shortages of cash income and food. Low food crop production exacerbated cash shortages as households increased the proportion of foods purchased in the market, in particular rice. Cash shortages translated into difficulties for households meeting costs associated with healthcare and education. Respondents in focus groups noted that for most households, these impacts subsided from July 2016 onwards as the wet season was characterised by high levels of rainfall and then the 2016–2017 dry season had intermittent rains leading to strong production.

Interviewees and focus group participants characterised communities' response to the drought as mainly consisting of 'tightening belts[5]'. However, during discussions with research participants concerning which factors differentiated people's ability to cope with and respond to the drought two key issues emerged consistently: utilising wetland areas for growing crops and borrowing money. The dynamics of utilising wetlands and borrowing are explored below by integrating a discussion of livelihood practice implications of the strategies, and how knowledge, beliefs and institutions influence the characteristics of resilience in the communities and constituent individuals.

### 4.2. Wetlands and resilience in Ghana's cocoa landscape

Despite the discourse concerning wetlands being dominated by environmental concerns, there is growing recognition of wetlands as a critical resource for sustaining livelihoods (Woods et al., 2013) Conventionally wetland areas[6] in the study area are left fallow, although, as is more common elsewhere in West Africa (Richards, 1986; Maconachie, 2008; Kiepe and Rodenburg, 2013) some farmers grow rice on them. During the 2015–2016 drought, however, they became a significant resource as they became viable for growing short-rotation food staples such maize and vegetables. This provided a vital boost to food production in the communities and, for farmers engaged with the activity, boosted incomes as the price of food in the villages increased. This response, while effective, was confined to those with access to wetland areas and knowledge of both how to grow crops on usually untended wetland areas and forewarning of the potential severity of the drought. Several participants complained that they could have planted more wetland areas with food crops had they been warned of the upcoming drought. But they balanced their complaints with the observation that 'The information that they [radio presenters – where most farmers get meteorological information] bring regarding meteorology is always wrong, so we don't even mind them'.

Knowledge of the value of wetlands in lessening the impact of drought, sharpened by the communities' experiences in 2015–2016, has also been reflected in reports of increasing draining of wetlands and permanent conversion of wetland areas to cocoa. This conversion occurs both in response to the drought and growing concerns over land scarcity in the area. The conversion of wetlands has raised concerns among some people in the community about the long-term impact on

[5] This quote is illustrative of a perception that was widely communicated in every focus group and several interviews. As the notes of one of the researchers field notes testify 'At this point I clarified the question [about what people did in response to drought] – but they said yes, we understand the question, but we didn't do anything differently'.

[6] Synonymously referred to as swampy, boggy or marshy areas and include areas immediately juxtaposing rivers, streams and ponds. There is not a clear binary distinction between wetland and non-wetland areas and the character of these areas is variable in intra- and inter-annual timescales. The general and common understanding of the wetland areas is of an areas that is unsuitable for crop production (with the exception of rice) most of the time.

water availability in the landscape, and the availability of wetland areas that could buffer the impacts of future droughts. To understand the character of this knowledge-practice interaction more deeply, it is instructive to examine the underpinning historical transformations in beliefs and institutions.

The lack of cultivation in wetland areas historically is not merely an agronomic practice. It is associated with traditional beliefs regarding the conservation of wetland areas to maintain healthy water bodies and protect adjacent land from drying. These beliefs are manifest in cultural taboos. As one respondent explained

> 'Sometimes a libation is poured into conserved areas to protect it. For example, a man in Amoabeng met this water body with mudfishes in. He knew the area was being conserved through spiritual means, but he didn't mind that and took the fish. He took some and cooked it. Then he became chilled and died. That created fear in those around, that's the main reason they invoke the spirits to protect areas. They know if there are fish in it, there is no way it will dry up'.

Traditional belief systems, however, have been, and continue to be, transformed by the introduction of Christianity and other religions (Ter Haar, 2009). This has contributed, among other factors, to the erosion of the authority of traditional belief systems and their associated means of conservation (e.g. (Sarfo-Mensah and Oduro, 2010)).[7] In combination with changing climatic and ecological conditions, this has resulted in a shift from farming based on traditional knowledge to a more experimental approach. The description offered by one cocoa farmer is typical:

> 'I've stopped using the traditional timings [for agricultural activities] … [Now] if I see some sunshine I will go and clear, if I see some rain I will just go and plant. If they [the plants] grow they grow, if they die they die. Those trends we had in the past are not reliable these days'.

The situation concerning the loss of traditional practices was summarised by a community member: 'Some people take it seriously, others don't … If you are free minded then you can [break taboos]'. These shifts in belief are mirrored in, and interwoven with, institutional changes concerning land management. In general, the preceding decades have seen the customary authority over land, which is mostly vested in the Stools,[8] decline and land tenure being increasingly individualised and monetised, although this is still almost exclusively informal[9] in rural areas (Amanor, 2010; Amanor and Ubink, 2008).

The relevance of this to wetland management and resilience are two-fold. First, the resulting arrangements means accessing wetland areas require either 1) financial capital in order to rent a wetland area[10], or 2) a social connection to someone who is willing to offer available land on a sharecropping basis.[11] This means people in communities who are not well connected to individuals/families holding areas of wetland (generally people with larger land holdings) or who do not have available financial resources to rent land are unable to access wetland and are therefore generally less resilient. In some instances, people accessed land through what are referred to as 'soft norms' which allow the transfer of land as a temporary gift, for example between an uncle and his nephew. These institutional arrangements play a large role in explaining how the impact of the drought was socially differentiated within communities.

Second, the individualisation of land tenure and the declining influence of customary authorities in managing land is reflected in the challenges in governing land at a communal and landscape scale, which is a key policy concern in Ghana's cocoa sector (Asare, 2014; Commission, 2014). As one farmer noted:

> 'Some people won't agree to having some management decisions imposed on them. If I have a farm near a stream then it is up to me if I would choose to clear that area and farm it, or leave it. Some people would even clear it in the night if they want to, you can't do anything, it's just their decision'.

These findings echo those of Maconachie (2008:239) who argues 'it is the institutional processes that regulate the social relations of production that appear to determine whether or not a farmer able to successfully negotiate access to wetland resources, and mobilise labour required to transform them'. This in turn highlights a critical question; to what extent is the conversion of wetland areas in cocoa landscapes both an adaptive and mal-adaptive practice?

Although, access and use of wetlands is socially differentiated within communities, it played a key role in supporting cocoa communities during the 2015–2016 drought. The evolving knowledge, beliefs and institutions regarding the use of wetlands, that to a large degree facilitated the response, also simultaneously threatens to support an increased conversion of wetlands which might undermine future capacity to cope with droughts in the area. Although there is a dearth of hydrological studies in cocoa landscapes there is widespread concern among some segments of the community regarding the lack of institutions to manage the landscape, a challenge noted elsewhere in Africa (e.g. Kiepe and Rodenburg, 2013; Nabahungu and Visser, 2011). There are two notable issues here. First, the Ghanaian constitution vests land in the Traditional Authorities of the country, meaning that the State has limited authority to create institutions or control the governance arrangements of most land in Ghana. And second, the relatively fragmented jurisdictions of traditional authorities (relative to the state) and limited capacity in key aspects of landscape governance, for example in resource and land-use mapping, among traditional authorities mean that there is no effective landscape planning. The primary strategy, according to one respondent was hope; they postulated, 'people are praying for hearts to change, but meanwhile they are watching their environment be destroyed'.

The implications of this analysis is discussed with respect to Ghana's cocoa landscape and resilience more generally in Section 5 after examining how borrowing and lending money, the other primary response of cocoa farmers in the area, influences resilience.

### 4.3. Borrowing, credit and resilience

During the 2015–2016 drought, borrowing money from wealthier family or community members was critical to minimising the impact of the drought on livelihoods and associated practices and ensuring that households could meet their needs, in particular with respect to food, healthcare and educational costs. Lending and borrowing of money is not unusual in the studied communities, with money being borrowed most often in the lean season (~April–July for most households). The lending and borrowing of money is critical to resilience, particularly in years with severe lean periods such as 2015–2016. But as will be argued in this section, the institutions and beliefs that facilitate and underpin these financial transactions are interwoven with the barriers to enhance people's ability to cope and respond to droughts.

There are two primary modes of borrowing money in the studied communities, both of which depend on informal institutions and norms. Individuals either exchange an area of cocoa land for cash for an agreed

[7] Which also include protecting sacred groves to conserve patches of forests in the landscape. These are also dwindling in size and effectiveness.

[8] Stools are symbols of chiefly office. Ghana's constitution vests most of the land in Ghana in the Stools who are responsible for managing the land in trust for their people.

[9] Meaning that the agreements are not recognised by state institutions.

[10] In practice, even a capitalised individual will need to be introduced to a wetland owner by a trusted intermediary.

[11] The most frequent sharecropping arrangement during the 2015–2016 drought involved the landowner receiving two-thirds of the crop grown and the farmer retaining one third. But the proportions are agreed on a case-by-case basis.

number for years, known locally as *awowa*, or take a cash loan with repayment due with the onset of the cocoa harvest in September–October. The following two quotes articulate the typical conditions under these two forms of lending:

> 'People use their farm as collateral for 2, 3 or even up to 20 years. For example they receive some cash say 1500 cedis[12] for 1 acre of land and then the land is with someone else for a period of time … It is a widespread practice. Often those people who are parents and have children who are in second cycle education, they have no option except to go in for the loan to push the children'.

> 'They access loans informally, but the interest rate is 100%. Failure to pay means you have to pay an additional interest of 100%. So if you collected an amount of 100 cedis you owe 200 cedis. But if you can't pay then it will become 400 cedis, another 100%, and so on, 800, 1600, 3200 … Eventually the person can seize your cocoa if you can't repay. You will come to some agreement that they will take your harvest for a number of years, until they can reclaim the amount you owe.'

People know that the terms of these arrangements can become extremely unfavourable, but as one farmer summarised 'They have no option except for going in for loans, the child will go to school and needs to eat'. As Richards (1990) notes, the extent to which these arrangements represent usury or mutually beneficial patron-client relationships can depend on both the context as well as analytical perspective. Nonetheless, such arrangements are contingent upon mutually held institutions and built ultimately on relationships of trust and community belonging. As Santos and Barrett (2011) note, the poorest within society can be excluded from the social networks necessary to access informal credit. Unlike elsewhere in Ghana, where microcredit schemes have had mixed success (Ganle et al., 2015), key informants in this study interviewed noted that several microfinance initiatives had failed to become established in the villages, failing either due to lack of repayment in the case of lenders, or because people had run away with the money in the case of micro-savings initiatives. The resulting low levels of trust, combined with the informal nature of land tenure arrangements, noted previously, means that only informal financial transactions gain traction within communities.

In addition to these informal institutions facilitating the lending of money and, through land seizures, the enforcement of debt collection, traditional belief systems also play a role in the informal credit system. Although, as with borrowing and lending in general, there is some reticence to talk about spiritual practices relating to 'Juju', its importance is significant in the communities. As one respondent noted during a conversation about lending practices: 'There's no avenue for redress because it's a verbal agreement they enter into with witnesses and a default in repayment may result in curses. The fear of being cursed to death makes them honour these agreements'. Such beliefs and sanctions are part of the networks of trust that underpin functioning agricultural economies (Lyon, 2000). But, as discussed in the following section, the influence of these beliefs, and associated knowledge, institutions and livelihood practices form a series of paradoxes with respect to the climate resilience of Ghana's cocoa sector and its farmers.

## 5. Discussion – the implications of farmers' coping strategies for resilience

Drawing on the results above, summarised in Table 1, this section critically reflects on the findings above and argues that a bio-cultural perspective on resilience reveals that in agricultural contexts contending with climate change the concept is characterised by a series of tensions and contradictions. These include temporal scales, as

**Table 1**
Summary of key findings.

| Elements of a biocultural framework | | Resilience defining factors | Insights for climate resilience |
|---|---|---|---|
| | | Access to wetland | Access to credit | |
| | Livelihood practices Knowledge | Wetlands permit agricultural production during droughts, especially short rotation food crops.<br>Converting wetlands to agricultural production a key coping strategy.<br>Concern among some farmers over long-term impact of wetland conversion. | Credit key to meeting livelihood needs during drought.<br>Interest rates of 100% + are common.<br>Knowledge of risks (e.g. long-term indebtedness) associated with borrowing money high, yet lack of choice effectively coerces borrowers to enter punitive agreements. | - Contradictions across spatial-temporal scales<br>- Questions of equity and social differentiation must be central |
| | Institutions | Land tenure – e.g. access to wetland areas critical for determining *who* has access to wetlands.<br>Customary tenure institutions are changing, land increasingly commoditised/monetised. | Lending predominantly informal, relies on social norms and relationships of trust.<br>Land (held under customary tenure norms) can be used as collateral with informal loans. | - Resilience enhancing and undermining components entangled in social systems – (e.g. resilience enhancing taboos entangled with use of spiritual punishments used to entrench indebtedness) |
| | Beliefs and worldview | Traditional belief systems contain taboos for wetland conversion.<br>Shifting beliefs, e.g. conversion to mono-theistic faiths is contributing to an undermining of some taboos. | Spiritual belief system part of enforcing repayments … debtors threatened with spiritual curses. | |

[12] 1 cedis = ~0.2 USD.

highlighted in the cases of wetland expansion and credit lending; and the increasing disjuncture between individual and community resilience resulting from the erosion of communal traditions. As will be discussed below, the prevalence of fatalism has emerged in this context as both a coping strategy and a barrier to change. A synthesis of these issues demonstrates that the livelihood practices, knowledge, belief and institutions that characterise Ghana's cocoa community are composed of resilience enhancing and reducing components. The implications of this contention are addressed by way of conclusion.

The centrality of temporal scales are well-recognised within resilience research. For example the panarchy cycle, developed in pursuit of a general theory of resilience, highlights how short and fast social-ecological feedbacks and events interact with slower processes or renewal and transformation (Gunderson, 2001; Olsson et al., 2006; Walker et al., 2004). However, this work has less relevance in specific policy contexts where it is important to attend to navigating the policy-relevant trade-offs between resilience at different timescales. In the case of Ghana's cocoa communities, for example, conversion of wetlands for food production in times of drought/stress is an essential coping mechanism. More significantly, perhaps, this conversion is being reflected in more permanent conversion of wetlands for food crops and cocoa. While this enables individuals and communities to meet their short-term needs, the impact of wetland conversion may undermine the long-term suitability of landscape for cultivation and exacerbate the impacts of future drought events. Similarly, the institutions that currently facilitate the lending of money within villages, a critical coping mechanism, are structured in ways that can lead to permanent indebtedness or the loss of land undermining households' future ability to cope with or adapt to climate shocks.

Questions concerning the extent to which the conversion of wetlands are mal-adaptive are reflective of calls for 'landscape approaches' to questions of resilience (Abson et al., 2013; Cumming, 2011; Sayer et al., 2013). However, whilst much of this literature recognises the importance of institutions, focus tends to be concentrated on developing agro-ecological knowledge (Woods et al., 2013 (Bianchi et al., 2006; Tscharntke et al., 2011); rather than on how institutions mediate the livelihood practices which shape landscape configurations and associated social-economic outcomes. Put simply, significantly more attention has been paid to the ecology of landscape-scale management than the governance implications of pursuing landscape-scale management. One consequence of this trend within landscape research is that it underplays the tensions between communal and individual resilience and associated governance decisions. In the case of Ghana this is illustrated by the individualisation and monetization of land tenure arrangements which have undermined customary institutions and associated belief systems that facilitate communal landscape governance. This poses complex difficulties for pursuing climate resilience in the cocoa sector. Even if the conversion of wetlands was shown to be detrimental to the cocoa landscape, there are questions concerning how, in practice, it might be slowed or prevented. The normative questions this raises are challenging in a context characterised by heterogenous actors with respect to land-size, wealth and vulnerability to climate shocks. These include questions concerning which individual(s) should bear the cost of actions taken to enhance communal resilience, (how) should they be compensated, and what penalties or sanctions should be applied, and by whom.

Reflecting on the inter-connected nature of institutions, beliefs, knowledge and livelihoods practices reveals the scale and complexity of the challenge facing policy-makers and other actors who are interested in addressing climate resilience. For example, fatalism is one factor which has received limited attention in the resilience literature, that illustrates the complexities involved. Perry et al. (2007), noting the role of fatalism in coping with HIV/AIDS, describe fatalism in Ghana as a conviction in the inevitability of the fruition of a divine plan for one's life. One farmer's description of fatalism with respect to droughts is typical: 'They have the view that it will rain when it rains, and the sun will shine when it shines – it's in God's hands'. Many of the farmers interviewed said that they did not change their livelihood practices in response to the drought and simply tightened their belts believing that there was nothing they could do to improve their situation except pray and trust God. It is tempting to diagnose this as paralysing fatalism, and it may undermine individuals' and communities' agency. However, such beliefs could also be understood as playing a critical role as a psychological coping strategy amongst stressed individuals and communities, a belief that sustains them when their belts become loose. This social construction phenomena has been documented extensively in sociological and anthropological work on climate change (e.g. (Stehr and Von Storch, 1995))

Fatalism could be framed as an 'unattractive' feature of the belief system that undermines individual and collective motivation to take action, or, as a psychological means of coping in times of stress. However, neither view alone captures the entangled nature of different components of belief systems on motivations for actions. In most cases, when questioned further, farmer's characterised their belief concerning God's intervention as being one more characterised by partnership than pure fate. This view posits that both humans and God have agency in the world. As one farmer said: 'You just do regular weeding and then hand it over to God. He will take care of it'.

The example of fatalism is clear example of what Shaw et al. (2014) refer to as the paradox of resilience. That is, the characteristics of livelihood practices, knowledge, belief and institutions and their interactions, comprise both of resilience enhancing and resilience reducing at the same time. The factors which underpin the ability of cocoa farmers in Ghana to cope with and adapt to drought are intimately interwoven with the barriers to increasing their ability to cope with and adapt to future drought events. Examining resilience with a biocultural lens enriches resilience analysis as changes in livelihood practices, knowledge, beliefs and institutions are interwoven, the chains of causality are complex and difficult to diagnose. But a nuanced understanding of communities potentially targeted under resilience schemes and a more explicit recognition of normative content of proposed policy and legislative intervention can, as (Adger et al., 2009) express it, mean the social limits to adaptation are mutable. Such a nuanced perspective can help identify what enables and constrains people's response to climate change and climatic events in particular settings and what differentiates the capacity of different people to respond. The value of a biocultural approach to resilience and potential policy avenues for climate resilience in Ghana's cocoa sector are further explored by way of conclusion.

## 6. Concluding remarks

This study adopted a biocultural lens to interrogate the role of livelihood practices, knowledge, belief and institutions in shaping the climate resilience of Ghana's cocoa sector. This approach transcends the nature–culture dualism that impedes analyses that overlook the interactions between the two spheres of life and also addresses concerns that relations of power and inequality are normalised within the systems thinking that characterises some of the research on resilience. The analysis demonstrated that climate resilience in Ghana's cocoa community is characterised by a series of contradictions that together mean that the interwoven character of livelihood practices, knowledge, beliefs and institutions both facilitate and undermine resilience of farmers to climate change.

This study is a response to calls for research to move beyond simply identifying biophysical, knowledge and financial constraints on agricultural production and rural development and to address underlying political, social and psychological issues that contribute to and undermine resilience (Shackleton et al., 2015). Employing a bio-cultural lens facilitates analyses that complement biophysical and economic assessments by drawing into the analyses often neglected aspects that shape the interactions between individuals, communities and their

environments. Adopting a broader perspective, however, means that translating findings into policy-prescriptions is significantly more challenging. Nonetheless, a better understanding of context in which policy operates can inform more astute recommendations, as well as temper expectations of research delivering quick techno-fixes to environment-development problems.

With this in mind, six avenues for developing this work in the case of Ghana's cocoa sector emerge. First, there is a need for research that reveals how landscape configuration, including wetlands, influences the productivity of cocoa and food crops over decadal timescales; second, further research on how complimentary management practices such as the management of shade trees buffers or exacerbates climatic conditions and the institutional arrangements that deliver control over shade trees to farmers is required; third, focussed studies on, and novel experimental trials of, the institutional arrangements that facilitate landscape-scale governance in Ghana would beneficial, which will require partnering traditional authorities in a more meaningful way than has previously been achieved in Ghana. And fourth, trialling the use of mobile technologies to increase the choice of financial providers in cocoa communities holds some promise for improving savings and financial management among cocoa farmers. Fifth, the potential for insurance in the cocoa landscape (both food and cocoa crops) requires detailed investigation and trials.

Finally, and in more general terms, this analysis has also highlighted the extent of social differentiation within communities with respect to resilience. Evidently within communities there are winners and losers with respect to climate shocks, coping strategies and future adaptations. This further underlines the centrality of addressing equity. Questions regarding *who* is resilient to what, and who wins and loses from efforts to bolster resilience must remain integral to future research and practice on climate resilience.

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